REMARKS

Applicant has reviewed the Office Action mailed on November 17, 2004 as well as the art cited. Claims 39, 41, 47, 50, 57, 58, 60, 63, 85, 87-89, 92, 93, 95-98 have been amended. Claims 1-38, 64-65 and 68-84 have been canceled. Claims 39-63, 66-67, and 85-98 are pending in this application.

Claim Rejections

Claims 39, 41, 47, 57, 58, 60, 63, 85, 87-89, 92-93 and 95-98 are objected to because of informalities. The Applicant has amended the claims to correct the informalities.

Rejections Under 35 U.S.C. § 102

Claims 39, 50, 67, 90, 92 and 94 were rejected under 35 USC § 102(b) as being anticipated by Henson, (U.S. Patent No. 6,133,054). To establish a section 102 rejection, a single reference must teach every aspect of the claim either explicitly or inherently. MPEP 706(02).

Regarding independent Claim 39, Claim 39 is as follows:

39. A method of forming an integrated circuit with circuitry under a bond pad, the method comprising:

forming devices in and on a substrate;

forming a first metal layer;

forming a first layer of relatively thick insulating material overlaying the first metal layer, wherein the thickness of the first layer of relatively thick insulating material strengthens the integrated circuit;

forming a top metal layer overlaying the relatively thick insulating layer; and

forming a bond pad on a surface of the top metal layer.

The Applicant respectfully traverses the Examiner's rejection of Claim 39 as being anticipated by the Henson reference. The Henson reference does not teach every aspect of Claim

39. For example, the Henson reference does not teach "forming a first layer of relatively thick insulating material overlaying the first metal layer, wherein the thickness of the first layer of relatively thick insulating material strengthens the integrated circuit." The dielectric layer 716 of Figure 7 of the Henson reference is discussed in Column 4, lines 1-5 and lines 16-23. In particular, layer 716 is merely described as a dielectric layer 716. The Henson reference does not teach a "relatively thick insulating layer ... wherein the thickness ... strengthens the integrated circuit," as is disclosed and claimed in Claim 39 of the present application. Since, the Henson reference does not teach every aspect of Claim 39, an anticipation rejection under section 102 is improper.

Accordingly, the Applicant respectfully requests the withdrawal of the rejection of Claim 39 under section 102. Moreover, since Claims 40-49 depend from and further define patentably distinct Claim 39, the Applicant further respectfully requests the withdrawal of the rejection of these dependant claims. In addition, since the Applicant believes these dependant claims are allowable for the above reason, responses to all rejection of these claims may not have been put forth in this response. The Applicant, however, retains the right to respond to said rejections if a further response is required.

Regarding independent Claim 50, Claim 50 is as follows:

50. A method of forming an integrated circuit, the method comprising;

forming device regions in a substrate;

depositing a first metal layer overlaying the device regions;

patterning the first metal layer to form gaps, wherein the gaps extend in a current flow direction;

forming an insulating layer overlaying the first metal layer and filling in the gaps, wherein the gaps strengthen the integrated circuit by providing pillars of harder insulating material;

depositing a top layer of metal overlaying the insulating layer; and

forming a bond pad on a surface of the top layer of metal.

The Applicant respectfully traverses the Examiner's rejection of Claim 50 as being anticipated by the Henson reference. The Henson reference does not teach every aspect of Claim 50. For example, the Henson reference does not teach "pattering the first metal layer to form gaps, wherein the gaps extend in a current flow direction" and "forming an insulating layer overlaying the first metal layer and filling in the gaps, wherein the gaps strengthen the integrated circuit by providing pillars of harder insulating material. " Although, the Henson reference has a metal layer 712, the Examiner has failed to show gaps yet alone gaps that extend in a current flow direction as is claimed in Claim 50 of the present invention. Since, the Henson reference does not teach every aspect of Claim 50, an anticipation rejection under section 102 is improper.

Accordingly, the Applicant respectfully requests the withdrawal of the rejection of Claim 50 under section 102. Moreover, since Claims 51-56 depend from and further define patentably distinct Claim 50, the Applicant further respectfully requests the withdrawal of the rejection of these dependant claims. In addition, since the Applicant believes these dependant claims are allowable for the above reason, responses to all rejection of these claims may not have been put forth in this response. The Applicant, however, retains the right to respond to said rejections if a further response is required.

Regarding Claim 90, Claim 90 is as follows:

90. A method of forming an integrated circuit, the method comprising:
forming device regions on and in a substrate;
forming a first metal layer overlaying the substrate;
forming a top metal layer overlaying the first metal layer;
forming at least one bonding pad on the top metal layer; and
forming a first layer of insulating material separating the top metal layer from the first metal layer, wherein the first layer of insulating material has a thickness selected to resist cracking.

The Applicant respectfully traverses the Examiner's rejection of Claim 90 as being anticipated by the Henson reference. The Henson reference does not teach every aspect of Claim

90. For example, the Henson reference does not teach "forming a first layer of insulating material separating the top metal layer from the first metal layer, wherein the first layer of insulating material has a thickness selected to resist cracking." The dielectric layer 716 of Figure 7 of the Henson reference is discussed in Column 4, lines 1-5 and lines 16-23. In particular, layer 716 is merely described as a dielectric layer 716. Accordingly, the Henson reference does not teach a "forming a first layer of insulating material separating the top metal layer from the first metal layer, wherein the first layer of insulating material has a thickness selected to resist cracking," as is disclosed and claimed in Claim 90 of the present application. Since, the Henson reference does not teach every aspect of Claim 90, an anticipation rejection under section 102 is improper.

Therefore, the Applicant respectfully requests the withdrawal of the rejection of Claim 90 under section 102. Moreover, since Claims 91-94 depend from and further define patentably distinct Claim 90, the Applicant further respectfully requests the withdrawal of the rejection of these dependant claims. In addition, since the Applicant believes these dependant claims are allowable for the above reason, responses to all rejection of these claims may not have been put forth in this response. The Applicant, however, retains the right to respond to said rejections if a further response is required.

Regarding dependant Claim 94, Claim 94 is as follows:

94. The method of claim 90, further comprising:

forming gaps in the first metal layer to form pillars of relatively stiff insulating material passing through the first metal layer.

The Applicant respectfully traverses the examiner's rejection of dependant Claim 94 as being anticipated by the Henson reference. The Henson reference does not teach the forming of gaps in the first metal layer as claimed in Claim 94. Conductive layer 712 of the Henson reference is described in column 3, line 64 through Column 4 line 23 of the Henson reference. This description does not mention gaps in the first metal layer 712. Moreover, it appears that Figure 7 of the Henson reference merely illustrates an end of the conductive layer 712 not a gap.

Hence the Henson reference does not teach what has been claimed in Claim 94 and therefore respectfully requests the withdrawal of the rejection of Claim 94.

Claims 39, 41, 42, 44, 46, 48-50, 53, 56, 60, 64 and 66 were rejected under 35 USC § 102(e) as being anticipated by Imai et al, (U.S. Publication 2003/0045088). To establish a section 102 rejection, a single reference must teach every aspect of the claim either explicitly or inherently. MPEP 706(02).

Applicant notes that the alleged anticipation is by Imai et al. as cited above. However, the specific rejections to the claims reference a Cook et al. reference. Applicant assumes the Cook et al. references are typos and has responded to above rejection in light of the Imai et al. reference.

Regarding independent Claim 39, Claim 39 is as follows:

39. A method of forming an integrated circuit with circuitry under a bond pad, the method comprising:

forming devices in and on a substrate;

forming a first metal layer;

forming a first layer of relatively thick insulating material overlaying the first metal layer, wherein the thickness of the first layer of relatively thick insulating material strengthens the integrated circuit;

forming a top metal layer overlaying the relatively thick insulating layer; and

forming a bond pad on a surface of the top metal layer.

The Applicant respectfully traverses the Examiner's rejection of Claim 39 as being anticipated by the Imai et al. reference. The Imai et al. reference does not teach every aspect of Claim 39. For example, the Imai et al. reference does not teach "forming a first layer of relatively thick insulating material overlaying the first metal layer, wherein the thickness of the first layer of relatively thick insulating material strengthens the integrated circuit." Layers 12/15

of the Imai et al. reference are described in Paragraphs 53 through 56 and Paragraphs 73 through 75. In particular, layer 12 and layer15 are merely described as silicon oxide films 12/15. The Imai et al. reference does not teach a "relatively thick insulating layer ... wherein the thickness ... strengthens the integrated circuit," as is disclosed and claimed in Claim 39 of the present application. In contrast, the Imai et al. reference uses a laminate Tungsten film 22B to prevent cracking in wire bonding. Please see Paragraphs 61 and 95 of the Imai et al. reference. Since, the Imai et al. reference does not teach every aspect of Claim 39, an anticipation rejection under section 102 is improper.

Accordingly, the Applicant respectfully requests the withdrawal of the rejection of Claim 39 under section 102. Moreover, since Claims 40-49 depend from and further define patentably distinct Claim 39, the Applicant further respectfully requests the withdrawal of the rejection of these dependant claims. In addition, since the Applicant believes these dependant claims are allowable for the above reason, responses to all rejection of these claims may not have been put forth in this response. The Applicant, however, retains the right to respond to said rejections if a further response is required.

Regarding independent Claim 50, Claim 50 is as follows:

50. A method of forming an integrated circuit, the method comprising;

forming device regions in a substrate;

depositing a first metal layer overlaying the device regions;

patterning the first metal layer to form gaps, wherein the gaps extend in a current flow direction;

forming an insulating layer overlaying the first metal layer and filling in the gaps, wherein the gaps strengthen the integrated circuit by providing pillars of harder insulating material;

depositing a top layer of metal overlaying the insulating layer; and

forming a bond pad on a surface of the top layer of metal.

The Applicant respectfully traverses the Examiner's rejection of Claim 50 as being anticipated by the Imai et al. reference. The Imai et al. reference does not teach every aspect of Claim 50. For example, the Imai et al. reference does not teach "pattering the first metal layer to form gaps, wherein the gaps extend in a current flow direction" and "forming an insulating layer overlaying the first metal layer and filling in the gaps, wherein the gaps strengthen the integrated circuit by providing pillars of harder insulating material. " The first metal layer 11 of the Imai et al. reference is described in Paragraphs 53 through 56 and 72 of the Imai et al. reference. Although, paragraph 72 of the Imai et al. reference indicates the wiring line 11 is etched, it does not teach "pattering the first metal layer to form gaps, wherein the gaps extend in a current flow direction." Since, the Imai et al. reference does not teach every aspect of Claim 50, an anticipation rejection under section 102 is improper.

Accordingly, the Applicant respectfully requests the withdrawal of the rejection of Claim 50 under section 102. Moreover, since Claims 51-56 depend from and further define patentably distinct Claim 50, the Applicant further respectfully requests the withdrawal of the rejection of these dependant claims. In addition, since the Applicant believes these dependant claims are allowable for the above reason, responses to all rejection of these claims may not have been put forth in this response. The Applicant, however, retains the right to respond to said rejections if a further response is required.

Regarding independent Claim 57, Claim 57 is as follows:

57. A method of forming an integrated circuit, the method comprising:

forming device regions in and on a substrate;

forming a first metal layer overlaying the device regions;

forming an insulating layer overlaying the first metal layer;

forming a top metal layer overlaying the insulating layer including a sub-layer of relatively stiff material near the insulating layer, wherein the insulating layer is positioned directly between the first metal layer and the top metal layer; and

forming a bonding pad on a surface of the top metal layer.

The Applicant respectfully traverses the Examiner's rejection of Claim 57 as being anticipated by the Imai et al. reference. The Applicant has amended Claim 57 to clarify the difference between Claim 57 and the Imai et al. reference. The Imai et al. reference does not teach every aspect of amended Claim 57. Moreover, the Examiner is incorrect in stating that the Imai et al. reference teaches "forming a bond pad 21B/22B on a surface of the top metal layer 18A/18B (Figs 10-11)." The top metal layer is layer 23D. Please see the first metal layer 23D in Figure 10 and paragraph 80 of the Imai et al. reference. In addition, the Examiner is incorrect in asserting "forming a first metal layer 11 overlaying the device region 5/6/7 (Fig. 3)." The first metal layer is metal layer 18B which is coupled to the top metal layer 23D by laminate film 22 (22B) which is a Tungsten film (hence the tungsten film 22B is directly between the top metal layer 23D and the first metal layer 18B). Please see Figure 9 and paragraphs 61 and 95 of the Imai et al. reference. Therefore, the Imai et al. reference does not teach the aspects as set out in amended Claim 57.

Accordingly, the Applicant respectfully requests the withdrawal of the rejection of Claim 57 under section 102. Moreover, since Claims 58-63 depend from and further define patentably distinct Claim 57, the Applicant further respectfully requests the withdrawal of the rejection of these dependant claims. In addition, since the Applicant believes these dependant claims are allowable for the above reason, responses to all rejection of these claims may not have been put forth in this response. The Applicant, however, retains the right to respond to said rejections if a further response is required.

Rejections Under 35 U.S.C. § 103

Claims 40, 51, 61 and 91 were rejected under 35 USC § 103(a) as being unpatentable over Imai et al.

To establish a *prima facie* case of obviousness under 35 U.S.C. § 103, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Second, there must be a reasonable expectation

of success. Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations. MPEP 2143

The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, not in applicant's disclosure. MPEP 2143 citing *In re Vaeck*, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991).

When applying 35 U.S.C. §103, the claimed invention must be considered as a whole; the references must be considered as a whole and must suggest the desirability and thus the obviousness of making the combination; the references must be viewed without the benefit of impermissible hindsight vision afforded by the claimed invention and a reasonable expectation of success is the standard with which obviousness is determined. *Hodosh v. Block Drug Co., Inc.*, 786 F.2d 1136, 1143 n.5, 229 USPQ 182, 187 n.5 (Fed. Cir. 1986).

Regarding dependant claims 40, 51, 61 and 91, the Applicant traverses the examiner's rejections. Each of these claims include similar aspects regarding the thickness of the first layer of relatively thick insulating material. In particular that the first layer is a layer of oxide that has a thickness of at least 1.5 μm thick. The Examiner is incorrect in asserting it would have been obvious in light of the Imai et al. reference "because it is a matter of determining optimum process condition by routine experimentation." The Imai et al. reference prevents cracking in the wire bonding by coupling the top metal layer 23D (bonding pad BP 23D) to the fist metal layer 18B with a laminate file 22B. Please see Figure 2, Figure 10 and paragraphs 61 and 95 of the Imai et al. reference. Hence, the Imai et al. reference teaches away from using relatively thick insulating layers of a select thickness to strengthen the integrated circuit since the integrated circuit in the Imai et al. reference is strengthening (or at least cracking in wire bonding is prevented) by a different structure as discussed above.

Moreover, the present invention seeks to solve the problem of not being able to use the area directly under bond pads as an active area to form devices and interconnects. The solution to the problem as presented in the claims of the present application allow for the use of the first metal layer (as well as all other metal layers under the first metal layer) for an interconnect path. As illustrated above, in the Imai et al. reference the first metal layer is used as part of the

strengthening solution and cannot be used as an interconnect line. Moreover, The Imai et al. reference relates to solving the problem of peeling between a bonding pad and an insulating film. Please read the abstract of the Imai et al. references. The Imai et al. reference does not relate to a device with an active area under the bonding pad. Please refer to the Figures of the Imai et al. reference. Accordingly, there is no suggestion or motivation to modify the Imai et al reference to select relatively insulating material of a select thickness to strengthen the integrated circuit since the Imai et al. reference is not addressing the formation of an active area under a bond pad.

Allowable Subject Matter

Claims 43, 45, 47, 52, 54-55, 58,59 and 62 were objected to as being dependent upon a rejected base claim, but were indicated to be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Claims 85 and 95 were indicated to be allowable if rewritten to overcome the rejection(s) under 35 USC § 112 set forth in the Office Action.

Claims 86-89 and 96-98 were objected to as being dependent upon a rejected base claim, but were indicated to be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Claim 93 were objected to as being dependent upon a rejected base claim, but were indicated to be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

CONCLUSION

Applicant respectfully submits that claims 39-63, 66-67, and 85-98 are in condition for allowance and notification to that effect is earnestly requested. If necessary, please charge any additional fees or credit overpayments to Deposit Account No. 502432.

If the Examiner has any questions or concerns regarding this application, please contact the undersigned at 612-455-1690.

Respectfully submitted,

Date: 3-17-05

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